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### **Implications of Tumor Heterogeneity for Precision Medicine**

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Medical physics is intimately connected with medicine, and is progressing along a similar path. General trend of medicine, particularly oncology, towards personalized treatment gave rise to precision medicine, which addresses the highly complex nature of disease. However, there are severe obstacles to overcome. For example, cancers evolve in time to become harder targets to treat. Understanding treatment resistance, and its development, often connected with the highly heterogeneous nature of the disease, is another key obstacle. Use of multi-modality imaging techniques such as molecular imaging is one of the solutions that medical physics can offer. Examples from clinical trials utilizing advanced molecular imaging, highlighting intra-tumor and inter-tumor heterogeneity will be presented. New understanding of cancer treatment response dynamics will be outlined. Potential for improved patient treatment designs stemming from these novel insights will be discussed.